REMARKS

A review of the claims indicates that:

Claims 2-3, 5-8, 10-19, 21-27, 29-31, 34, 36, and 38 remain in their original form.

Claims 1, 4, 9, 20, 28, 32-33, 35, and 37 are currently amended.

No claims are currently cancelled.

Claims 9, 20, and 33 are rejected under 35 U.S.C. §112 first paragraph as failing to comply with the enablement requirement.

Claims 1-38 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,822,781 to Wells *et al.* (hereinafter "Wells"), in view of U.S. Patent No. 5,630,093 to Holzhammer *et al.* (hereinafter "Holzhammer").

Claims 1-38 remain in this application.

In view of the following remarks, Applicant respectfully requests reconsideration of the rejected claims and allowance of the subject application.

Telephone Conversation with Examiner

Applicant wishes to thank the Examiner for the telephonic conversations on May 12, 2005 and August 1, 2005. Applicant particularly appreciates the Examiner's preliminary indication of the novel and nonobvious nature of the limitation of storing a logical sector address at the physical sector address of the flash memory medium assigned to the logical sector address (such that, for example, an assignment map showing the assignment of a physical sector address to a logical sector address may be quickly reestablished after, for example, a power outage).

Correction of Objected to Drawings

The drawings of the present application are amended to comply with 37 CFR 1.84(u)(1) and 37 CFR 1.121(d), as set out on Page 2 of the Office Action. Copies of the amended drawings are attached to this paper.

Update of Dependency information

In order to comply with the requirements set out on Page 3 of the Office Action, paragraph 1 of subject application (the section entitled "Related Application") is amended to reflect that application number 10/087,590 -- from which the subject application claims priority -- has issued as U.S. Patent No. 6,901,499.

Claim Rejections under 35 U.S.C. §112, first paragraph

Claims 9, 20 and 33

Claims 9, 20, and 33 are rejected under 35 U.S.C §112, first paragraph as failing to comply with the enablement requirement. Applicant has obviated this rejection by amending claims 9, 20, and 33 to include language suggested by the Examiner on page 4 of the Office Action.

Claim Rejections under 35 U.S.C. §103

Claims 1-38

Claims 1-38 are rejected as being unpatentable over Wells in view of Holzhammer. Applicant respectfully traverses the rejection.

Amended claim 1 recites:

> A flash driver system, comprising:
>
> a free sector manager, configured to determine a next free physical sector address on a media and assign the address to a logical sector address of a write request received from a file system;
>
> a table, configured to store a map showing the assignment of the physical sector address to the logical sector address; and
>
> a flash medium logic, configured to write the data to the next free physical sector indicated by the free sector manager and store the logical sector address directly with the data on the flash memory medium.

Neither Wells nor Holzhammer, alone or in combination, discloses, teaches, or suggests the flash driver system recited in claim 1. In particular,

neither Wells nor Holzhammer discloses, teaches, or suggests "a free sector manager, configured to determine a next free physical sector address on a media and assign the address to a logical sector address of a write request received from a file system" or "a flash medium logic, configured to write the data to the next free physical sector indicated by the free sector manager and store the logical sector address directly with the data on the flash memory medium".

For example, Wells discloses a solid state memory disk that stores data on a sector basis (please see Abstract). According to the teachings of Wells, once a disk receives a command to write data, a microprocessor must undertake an "involved process" to allocate sufficient memory within a flash array to store the sector of data. (Column 14, lines 6-12 and Column 15, lines 15-19). This involved process includes the "complex and critical" tasks of allocating memory space, selecting an appropriate memory location to prevent memory degradation, and making four major decisions –(i) are there sufficient FLASH memory reserves to allow the write, (ii) is there enough free memory in the block to which the current process was last allocated to store the current sector, (iii) is there a block with enough free FLASH memory to store the sector data, and (iv) is that block an appropriate block in which to store the sector? (Column 15, lines 50-62). The full method for allocating memory space for a write under Wells is shown in Figs. 10A and 10B, and encompasses more than 30 steps. Thus, once a write request is received, Wells teaches that an involved and time exhausting process must be undertaken to find appropriate free memory space in which to store the data to be written.

This is markedly different that the flash driver system cited in claim 1 in which a free sector manager determines a next free physical sector address on a media and assigns the address to a logical sector address of a write request received from a file system. Thus, once a write request is received, a flash memory logic can write data to the next free physical sector indicated by the free sector manager without having to pause the write process in order to proceed through the "involved", "complex" and time-consuming process of allocating memory space as taught by Wells.

In addition, as admitted by the Office, Wells makes no mention of an ability to re-establish an erased mapping of physical to logical addresses. (Office Action, page 4). In this regard the Office relies on Holzhammer, which discloses a non-volatile semiconductor memory that is erased in blocks. (Holzhammer Abstract). Under Holzhammer, a compressed version of a cluster mapping table in which logical addresses are mapped to physical addresses is stored in RAM of a personal computer system. (Column 21, lines 29-32; Column 15, lines 4-7; and Fig 12). Accordingly, in the event of a power failure, the cluster mapping table taught by Holzhammer will be permanently lost. Essentially, Holzhammer represents the very prior art that Applicant sought to overcome. Moreover, Holzhammer makes no mention of storing the logical sector address directly with the data on the flash memory medium.

In contrast, by using the flash driver system as recited in claim 1, each logical sector address is saved directly with the data on the flash memory medium. Thus, after a power failure, by scanning the flash memory medium, the logical

sector addresses may be read, and an in-memory lookup table may be easily updated.

Thus, Wells and Holzhammer, both singly and in combination, fail to disclose, teach, or suggest the elements recited in claim 1.

The Office argues that the claimed flash driver system of claim 1 is disclosed in Wells (Column 4, lines 10 et seq.; Table 84; and Column 13, lines 64 et seq.) and Holzhammer (Figure 12). (Office Action, page 5). Applicant respectfully disagrees. As noted above, Wells teaches undertaking an "involved", "complex" and time-consuming process of allocating free memory space each time a write request is received before data can be written. In contrast, once a write request is received by the flash driver system recited in claim 1, the flash memory logic can write data to the next free physical sector indicated by the free sector manager. Thus, the flash driver system recited in claim 1 can react to write requests more quickly and efficiently than could a device using the teachings of Wells.

Holzhammer fails to provide any missing teachings. As discussed above, the compressed version of a cluster mapping table shown in Fig. 12 of Holzhammer is stored in RAM of a personal computer system. Thus, in the event that power to the personal computer is cut off, the cluster mapping table will be permanently lost. In contrast, the flash driver system recited in claim 1 includes a flash memory logic configured to store the logical sector address directly with the data on the flash memory medium. Thus, after a power failure situation, an in-memory lookup table may be easily reestablished by scanning the flash memory medium and reading the logical sector addresses from the flash memory medium.

Accordingly, the combination of Wells and Holzhammer fails to disclose, teach, or suggest the flash driver system of claim 1. Applicant respectfully requests that the §103 rejection of claim 1 be withdrawn.

Dependent claims 2-3 are allowable at the least by virtue of their dependency on base claim 1, as well as for the additional elements they contain. Applicants respectfully request that the §103(a) rejection of claims 2-3 be withdrawn.

Amended claim 4 recites:

> A flash driver system, comprising:
>
> a free sector manager, configured to maintain a list of at least one free physical sector address available on a flash memory medium;
>
> a flash abstraction logic, configured to query the free sector manager for the next free physical sector address and link the physical sector address to a logical sector address received from a file system; and
>
> a table, configured to store the physical sector address to logical sector address linking performed by the flash abstraction logic.

Neither Wells nor Holzhammer discloses, teaches, or suggests the flash driver system recited in claim 4. As discussed in more detail above in conjunction with claim 1, the combination of Wells and Holzhammer fails to disclose, teach, or suggest "a free sector manager, configured to maintain a list of at least one free physical sector address available on a flash memory medium" and "a flash abstraction logic, configured to query the free sector manager for the next free physical sector address and link the physical sector address to a logical sector address received from a file system" as recited in claim 4.

Instead, as discussed in more detail above, according to the teachings of Wells, once a disk receives a write command, a microprocessor must undertake an "involved process" to allocate sufficient memory within a flash array to store the sector of data. (Column 14, lines 6-12 and Column 15, lines 15-19). This involved process encompasses more than 30 steps (as shown in Figures 10A and 10B) and includes the "complex and critical" tasks of allocating memory space, selecting an appropriate memory location to prevent memory degradation, and making four major decisions. (Column 15, lines 50-62). Thus, under Wells, before each write request can be completed an involved and time exhausting process must be undertaken to find appropriate free memory space into which data can be written.

This is markedly different than the flash driver system recited in claim 4 in which a free sector manager is configured to maintain a list of at least one free physical sector address available on a flash memory medium. Using such a free sector manager, once a write request is received, for example, a flash abstraction logic may query the free sector manager for the next free physical sector address and link the physical sector address to a logical sector address received from a file system. In this way, the logical sector address and the physical sector address may be linked immediately, without having to go through the complex and time consuming memory allocation process taught in Wells.

As noted above, Holzhammer fails to offer any missing teachings. Thus, Wells and Holzhammer, both singly and in combination, fail to disclose, teach, or suggest the elements recited in claim 4.

In rejecting claim 4, the Office makes the same references to Wells and Holzhammer, as were made in its rejection of claim 1. However, as discussed above, the Office's assessment of Wells and Holzhammer is faulty.

The flash driver system recited in claim 4, includes "a free sector manager, configured to maintain a list of at least one free physical sector address available on a flash memory medium" and "a flash abstraction logic, configured to query the free sector manager for the next free physical sector address and link the physical sector address to a logical sector address received from a file system". Thus when a need arises in which a logical sector address must be linked to a physical sector address, the flash abstraction logic recited in claim 4 need not proceed through the complex and time consuming process taught by Wells. Instead, the flash abstraction logic needs only to query the free sector manager for a next free physical sector address. Thus, the flash driver system recited in claim 4 is able to link a logical sector address to a physical sector address more quickly, and in a much less complex fashion, that would be possible using the teachings of Wells. Moreover, as discussed in more detail above in conjunction with claim 1, Holzhammer does not remedy the failings of Wells.

Accordingly, the combination of Wells and Holzhammer fails to disclose, teach, or suggest the flash driver system of claim 4. Applicant respectfully requests that the §103 rejection of claim 4 be withdrawn.

Dependent claims 5-8 are allowable at the least by virtue of their dependency on base claim 4, as well as for the additional elements they contain. Applicants respectfully request that the §103(a) rejection of claims 5-8 be withdrawn.

Amended claim 9 recites:

> A memory device comprising:
>
> a free sector manager to determine a next free physical sector address on a flash memory medium and to assign the physical sector address to a logical sector address;
>
> an assignment map to store data corresponding to the physical sector address to the logical sector address assignment,
>
> wherein the next free physical sector accepts data without requiring to be erased in direct response to the issuance of a write request associated with said data; and
>
> wherein the logical sector address associated with the stored data is stored at the physical sector address of the flash memory medium assigned to the logical sector address.

Neither Wells nor Holzhammer discloses, teaches, or suggests the memory device recited in claim 9. As discussed in more detail above in conjunction with claims 1 and 4, the combination of Wells and Holzhammer fails to disclose, teach, or suggest "a free sector manager to determine a next free physical sector address on a flash memory medium and to assign the physical sector address to a logical sector address", "wherein the next free physical sector accepts data without requiring to be erased in direct response to the issuance of a write request associated with said data" and "wherein the logical sector address associated with the stored data is stored at the physical sector address of the flash memory medium assigned to the logical sector address" as recited in claim 9.

Instead, under Wells once a disk receives a write command, a microprocessor must undertake an "involved process" to allocate sufficient memory within a flash array to store the sector of data. (Column 14, lines 6-12

and Column 15, lines 15-19). This involved process encompasses more than 30 steps (as shown in Figures 10A and 10B) and includes the "complex and critical" tasks of allocating memory space, selecting an appropriate memory location to prevent memory degradation, and making four major decisions. (Column 15, lines 50-62). Thus, under Wells, before each write request can be completed an involved and time exhausting process must be undertaken to find appropriate free memory space into which data may be written.

This is markedly different than the memory device recited in claim 9 in which a next free physical sector accepts data without requiring to be erased in direct response to the issuance of a write request associated with said data. This results because the free sector manager determines a next free physical sector address on a flash memory medium and assigns the physical sector address to a logical sector address. In this way, a physical sector address may be assigned to a logical sector address immediately, without having to go through the complex and time consuming memory allocation process taught in Wells.

As noted above, Holzhammer fails to offer any missing teachings. Instead, under Holzhammer, a compressed version of a cluster mapping table in which logical addresses are mapped to physical addresses is stored in RAM of a personal computer system. (Column 21, lines 29-32; Column 15, lines 4-7; and Fig 12). Accordingly, in the event of a power failure the cluster mapping table will be permanently lost. Essentially, Holzhammer represents the very prior art that Applicant sought to overcome. Moreover, Holzhammer makes no mention of a logical sector address associated with the stored data being stored at the physical sector address of the flash memory medium assigned to the logical sector address.

In contrast, by using the flash driver system as recited in claim 9, each logical sector address is saved directly with the data with which it is associated at the physical address on the flash memory medium. Thus, after a power failure situation, an in-memory lookup table may be quickly and easily reestablished by scanning each physical address of the flash memory medium from which a corresponding logical sector address may be read.

Accordingly, Wells and Holzhammer, both singly and in combination, fail to disclose, teach, or suggest the elements recited in claim 9.

In rejecting claim 9, the Office makes the same references to Wells and Holzhammer, as were made in its rejections of claims 1 and 4. However, as discussed above, the Office's assessment of Wells and Holzhammer is faulty.

The memory device recited in claim 9, includes "a free sector manager to determine a next free physical sector address on a flash memory medium and to assign the physical sector address to a logical sector address", "wherein the next free physical sector accepts data without requiring to be erased in direct response to the issuance of a write request associated with said data". Thus when a need arises in which a physical sector address must be assigned to a logical sector address, the memory device recited in claim 9 need not proceed through the complex and time consuming process taught by Wells. Instead, the physical sector address determined by the free sector manager can accept data without requiring to be erased in direct response to the issuance of a write request associated with said data. Thus, the memory device recited in claim 9 is able to facilitate the acceptance of data into a free physical sector more quickly, and in a much less

complex fashion that would be possible using the teachings of Wells and Holzhammer.

Moreover, the memory device recited in claim 9 recites "the logical sector address associated with the stored data is stored at the physical sector address of the flash memory medium assigned to the logical sector address". Thus, after a power failure situation, by scanning the flash memory medium, the logical sector addresses may be read from their corresponding physical sector addresses, and an in-memory lookup table may be reestablished accordingly.

In contrast, according to Holzhammer, a compressed version of a cluster mapping table is stored in RAM of a personal computer system. Thus, in the event that power to the personal computer is cut off, the cluster mapping table will be permanently lost. This essentially represents the same prior art that Applicant sought to overcome.

Accordingly, the combination of Wells and Holzhammer fails to disclose, teach, or suggest the memory device of claim 9. Applicant respectfully requests that the §103 rejection of claim 9 be withdrawn.

Dependent claims 10-19 are allowable at the least by virtue of their dependency on base claim 9, as well as for the additional elements they contain. Applicants respectfully request that the §103(a) rejection of claims 10-19 be withdrawn.

Amended claim 20 recites:

> A method comprising:
> determining a next free physical sector address on a flash memory medium;

> assigning the physical sector address to a logical sector address; and
>
> generating an assignment map of data corresponding to the physical sector address to the logical sector address assignment,
>
> wherein the next free physical sector accepts data without requiring to be erased in direct response to the issuance of a write request associated with said data; and
>
> wherein the logical sector address is stored at the physical sector address of the flash memory medium assigned to the logical sector address.

Neither Wells nor Holzhammer discloses, teaches, or suggests the method recited in claim 20. As discussed in more detail above in conjunction with claims 1,4 and 9 above, the combination of Wells and Holzhammer fails to disclose, teach, or suggest "determining a next free physical sector address on a flash memory medium", "wherein the next free physical sector accepts data without requiring to be erased in direct response to the issuance of a write request associated with said data" and "wherein the logical sector address is stored at the physical sector address of the flash memory medium assigned to the logical sector address" as recited in claim 20.

Instead, under Wells once a disk receives a write command, a microprocessor must undertake an "involved process" encompasses more than 30 steps to allocate sufficient memory within a flash array to store the sector of data. (Column 14, lines 6-12; Column 15, lines 15-19; and Figures 10A and 10B). This is markedly different than the method recited in claim 20, in which a next free physical sector accepts data without requiring to be erased in direct response to the issuance of a write request associated with said data. This results because a next

free physical sector address on the flash memory medium has already been determined.

Also, as noted above, Holzhammer fails to offer any missing teachings. Under Holzhammer, a compressed version of a cluster mapping table in which logical addresses are mapped to physical addresses is stored in RAM of a personal computer system -- essentially representing the very prior art that Applicant sought to overcome.

In contrast, by using the method recited in claim 20, the logical sector address is stored at the physical sector address of the flash memory medium assigned to the logical sector address. Thus, after a power failure situation, an in-memory lookup table may be quickly and easily reestablished by scanning each physical address of the flash memory medium from which a corresponding logical sector address may be read.

Thus, Wells and Holzhammer, both singly and in combination, fail to disclose, teach, or suggest the elements recited in claim 20.

In rejecting claim 20, the Office makes the same references to Wells and Holzhammer, as were made in its rejections of claims 1, 4 and 9 above. However, as discussed above, the Office's assessment of Wells and Holzhammer is faulty.

The method recited in claim 20, includes "determining a next free physical sector address on a flash memory medium", "wherein the next free physical sector accepts data without requiring to be erased in direct response to the issuance of a write request associated with said data". Thus when a need arises in which data must be written to a physical sector address, the method recited in claim 20 need not proceed through the complex and time consuming process taught by Wells.

Instead, the physical sector address is already determined and ready to accept data without needing to be erased in direct response to the issuance of a write request associated with said data. Thus, the method recited in claim 20 is able to facilitate the acceptance of data into a free physical sector more quickly, and in a much less complex fashion than would be possible using the teachings of Wells and Holzhammer.

Moreover, the method of claim 20 recites "the logical sector address is stored at the physical sector address of the flash memory medium assigned to the logical sector address". Thus, after a power failure situation, by scanning the flash memory medium, logical sector addresses may be read from their corresponding physical sector addresses, and an in-memory lookup table may be quikly and easily reestablished.

In contrast, according to Holzhammer a compressed version of a cluster mapping table is stored in RAM of a personal computer system. Thus, in the event that power to the personal computer is cut off, the cluster mapping table will be permanently lost. This essentially represents the same prior art that Applicant sought to overcome.

Accordingly, the combination of Wells and Holzhammer fails to disclose, teach, or suggest the method of claim 20. Applicant respectfully requests that the §103 rejection of claim 20 be withdrawn.

Dependent claims 21-31 are allowable at the least by virtue of their dependency on base claim 20, as well as for the additional elements they contain. For example, **amended claim 28** recites "maintaining a write pointer indicating the next free physical sector address on the flash memory medium". Such a write

pointer enables the method recited in claim 28 to immediately assign a physical sector address to a logical sector address, and enable the next free physical sector to accept data without requiring the free physical sector to be erased in direct response to the issuance of a write request associated with said data. In this manner a data may be written to a physical sector without needing to pause in order to undertake the complex and time consuming memory allocation process taught by Wells.

Dependant **claim 29** recites, in pertinent part, "scanning one or more sectors of the flash memory medium for the logical sector address; noting the physical sector address from which the logical sector address is stored; and reestablishing the assignment map in the event the assignment map is erased." Similarly, dependant **claim 30** recites, in pertinent part, scanning one or more blocks of the flash memory medium for the logical sector address; noting the physical sector address from which the logical sector address is stored; and reestablishing the assignment map in the event the assignment map is erased. Thus, in both claims 29 and 30, an assignment map may be reestablished after an event such as a power outage, by simply scanning the flash memory medium. Such an action would yield no such useful results under the teachings found in Holzhammer and Wells above, because neither reference teaches saving logical sector address information at the physical sector address.

Applicants respectfully request that the §103(a) rejection of claims 21-31 be withdrawn.

Amended claim 32 recites:

> An apparatus comprising:
> means for determining a next free physical sector address on a flash memory medium;
> means for assigning the physical sector address to a logical sector address;
> means for storing the logical sector address at the physical sector address of the flash memory medium assigned to the logical sector address; and
> means for generating an assignment map of data corresponding to the physical sector address to the logical sector address assignment.

Neither Wells nor Holzhammer discloses, teaches, or suggests the apparatus recited in claim 32. As discussed in more detail above in conjunction with claims 1,4, 9 and 20 above, the combination of Wells and Holzhammer fails to disclose, teach, or suggest "means for storing the logical sector address at the physical sector address of the flash memory medium assigned to the logical sector address" as recited in claim 32.

Instead, under Holzhammer, a compressed version of a cluster mapping table in which logical addresses are mapped to physical addresses is stored in RAM of a personal computer system -- essentially representing the very prior art that Applicant sought to overcome. Wells adds no missing teachings.

In contrast, by using the apparatus recited in claim 32, the logical sector address is stored at the physical sector address of the flash memory medium assigned to the logical sector address. Thus, after a power failure situation, an in-memory lookup table may be quickly and easily reestablished by scanning each

physical address of the flash memory medium from which a corresponding logical sector address may be read.

Thus, Wells and Holzhammer, both singly and in combination, fail to disclose, teach, or suggest the elements recited in claim 32.

In rejecting claim 32, the Office makes the same references to Wells and Holzhammer, as were made in its rejections of claims 1, 4, 9 and 20 above. However, as discussed above, the Office's assessment of Wells and Holzhammer is faulty.

The apparatus recited in claim 32, includes "means for storing the logical sector address at the physical sector address of the flash memory medium assigned to the logical sector address". Thus, after a power failure situation, an in-memory lookup table may be quickly and easily reestablished by scanning each physical address of the flash memory medium from which a corresponding logical sector address may be read.

In contrast, according to Holzhammer a compressed version of a cluster mapping table is stored in RAM of a personal computer system. Accordingly, in the event that power to the personal computer is cut off, the cluster mapping table will be permanently lost. Wells provides no missing teachings.

Consequently, the combination of Wells and Holzhammer fails to disclose, teach, or suggest the apparatus of claim 32. Applicant respectfully requests that the §103 rejection of claim 32 be withdrawn.

Dependent claims 33-38 are allowable at the least by virtue of their dependency on base claim 32, as well as for the additional elements they contain. For example, **amended claim 37** includes "means for maintaining a write pointer

indicating the next free physical sector address on the flash memory medium". Such a means enables the apparatus recited in claim 37 to immediately assign a physical sector address to a logical sector address. In this manner data may be written to a physical sector without pausing to undertake the complex and time consuming memory allocation process taught by Wells. Applicants respectfully request that the §103(a) rejection of claims 33-38 be withdrawn.

Conclusion

The Applicant submits that all of the claims are in condition for allowance and respectfully requests that a Notice of Allowability be issued. If any issue remains unresolved that would prevent allowance of this case, the Examiner is requested to contact the undersigned attorney to resolve the issue.

Respectfully Submitted,

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